

Louisiana Technology Innovation Fund

University of Louisiana at Lafayette Proposal

I. Project Title

The Center for the Digital Moving Image Project

II. Project Leader

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III. Executive Summary

The use of the moving image is increasingly pervasive in all segments of society. Its impact is exemplified in the film, television and music industries, in corporate training programs, in K-16 classrooms, and numerous other places almost to the point of ubiquity. There is scarcely a single contemporary movie or video that doesn't include sophisticated computerized digital moving images (DMI). Industry predictions are that within a few years, *all* movies will be produced *and* projected digitally—for better or worse virtually eliminating the use of film. The University of Louisiana at Lafayette and the surrounding region are uniquely positioned, *geographically, collaboratively, technologically, and culturally*, to provide leadership in the application of existing technologies and the development of new DMI technologies that will meet this need and help to build the economy of the state. Lafayette is the right place, at the right time, to create a dramatic and innovative fusion of *entertainment* and *information technology*.

UL Lafayette, in partnership with the Louisiana Department of Economic Development (LDED) and a cluster of cooperating institutions, businesses, organizations and service providers, proposes a pilot program that will result in the creation of the *Center for the Digital Moving Image*. The *Center* will provide the means for a dynamic interaction within the information technology (IT) cluster centered in Lafayette, and will include such participating partners as: the UL Lafayette College of the Arts and Center for Advanced Computer Studies (CACS); the Louisiana Film Commission and its parent LDED Office of Entertainment Cluster Development; the LDED Office of Information Technology Cluster Development; the Lafayette Economic Development Authority (LEDA); the Lafayette Chamber of Commerce and its program for local IT companies, Zydotech; the Manufacturing Extension Partnership of Louisiana (MEPoL); and filmmakers such as native Louisiana director Pat Mire.

The *Center for the Digital Moving Image* Pilot Project will:

- Create an interactive on-line digital image archive and a *Digital Moving Image Studio*;
- Provide outreach training and resources to Louisiana IT companies and manufacturers of digital images;
- Promote cutting-edge scientific research into data mining, digital imagery, and streaming video technology, along with growth in entertainment and information technology;
- Promote continued growth in economic development, educational capacity, and scientific progress;
- Establish the capacity for the long-term sustainability of the *Center*.

The technology being applied includes state-of-the-art computer, Internet, media composition, motion capture, and DV editing and processing equipment. The LTIF funding request for the project is \$999,890. The planned project start date is July 1, 2002.

IV. Description of the Project

A. Project Narrative

Imagine an information technology initiative that, once established, would place the State of Louisiana on the map as a leader in moving image technology development. If funded, the proposed project will do just that.

The University of Louisiana at Lafayette, in partnership with Louisiana Department of Economic Development (LDED) and a cluster of cooperating institutions, businesses, organizations and service providers, proposes a pilot program that will result in the creation of the *Center for the Digital Moving Image*. The *Center* will support and enhance an information technology (IT) cluster centered in Lafayette, within the rapidly developing “*Silicon Bayou*” stretching along the I-10 corridor.

Goals: The primary goal of the project will be to support the development of *Entertainment* and *Information Technology*, two of the nine industry clusters identified in Louisiana’s long-term master plan for economic development, *Vision 2020*. Following the lead of this plan, UL Lafayette proposes a bold new enterprise to strengthen the state’s entertainment and IT industries through an emphasis on business retention, creation and growth, and the delivery of services to our citizens.

The *Center* project embraces the three primary *Vision 2020* goals: (1) Re-creating our state as a *Learning Enterprise* for Louisiana’s businesses, institutions and citizens; (2) Building an economy based on *Technology Intensive Industries* actively utilizing Louisiana’s colleges and universities; and (3) Preserving, developing and promoting Louisiana’s *Natural and Cultural Assets* for their recreational and aesthetic values. The development of clusters fosters collaboration and cooperation that takes into account the inherent fabric of the economy—taking advantage of the interconnections between businesses and industries that are already there and the cultural values and sense of identity of the region. The *Center for the Digital Moving Image* will create and support an environment conducive to such collaboration and cooperation.

Outcomes: The *Center for the Digital Moving Image* will provide the creative engine to drive economic development. The *Center* will help channel the imaginative energies of numerous innovative artists, designers, videographers, filmmakers, programmers, educators and scientists and provide them the space, equipment and other necessary resources to work. The synergy produced by these collaborative efforts will be focused in the initial five-year action plan described in this proposal, including the two-year LTIF funded pilot project phase and the following three-year growth phase. During the initial two-year pilot project phase, the *Center for the Digital Moving Image* Project will achieve the following specific outcomes:

1. **Studio:** The *Center* will fully implement the initial infrastructure of a *Digital Moving Image Studio* and make it available to the industry and citizens of Louisiana. Through this Studio, training and assistance will be provided to existing professionals in Louisiana in upgrading their knowledge base. The Studio will encourage telecommuting capability of professionals by making infrastructure resources available to citizens, while working with existing local and regional agencies and organizations to assist and improve state-of-the-art technology access and to keep trained Louisiana professionals at home in our state.
2. **Services:** The *Center*, in partnership with the *Manufacturing Extension Partnership of Louisiana* (MEPoL), will build service delivery bridges and linkages to manufacturers in the State involved with digital technology, giving them access to technology equipment and infrastructure for training and management programs that will increase sales, utilize resources more effectively, and improve productivity. MEPoL is an established federally-supported service provider and broker already effectively serving the manufacturing community (see the Appendix for a more detailed description).
3. **Research:** The *Center*, through the participation of the *Center for Advanced Computer Studies* (CACS), will foster cutting-edge scientific research into data mining, digital imagery, and streaming video technology, research that will open doors to exciting new vistas of growth in entertainment and information technology, resulting in continued sustainable growth in economic development, educational capacity, and scientific progress.

4. **Archive:** The *Center* will create a digital video and still image archive to house numerous types of digital images, including a *Production Location Resource Archive* using DMI to promote Louisiana to the film/video/television/music industry in collaboration and conjunction with the Louisiana Film and Video Commission located within the LDED Office of Entertainment Cluster Development. The archive will be continually enlarged over the course of the project, and will grow to encompass numerous types of images from multiple sources. The image archive will be web enabled for accessibility worldwide using multiple levels of access and rapid search/retrieval technology using key words and fuzzy logic, and possessing built-in capability for citizen producers to add to the archive.
5. **Sustainability:** The *Center*, through a combination of service fees, investment by private industry partners, grant applications, and sponsored research and development, will develop a long-term capacity for sustainability and growth in order to achieve the anticipated outcomes of the years following the initial pilot phase of the project.

During the first five years of the project, the *Center for the Digital Moving Image* will anticipate the following additional outcomes (beyond the scope of the project goals):

- Highly-trained digital image and IT professionals will choose to remain in Louisiana, creating economic development opportunities within the state and/or “telecommuting” to job opportunities elsewhere;
- Economic development and job opportunities will be created as film and IT companies doing business in the state will seek the convenience of locally available digital production facilities and IT infrastructure;
- Businesses and industries will take advantage of *Center* technical assistance resources to develop better business practices and support sales, advertising, marketing and training programs;
- Tourism and awareness of cultural identity will be enhanced by the availability of more sophisticated production and distribution capacity;
- New strategies will be developed to incorporate emerging technologies, such as streaming videos, custom infotainment portals, third and fourth generation wireless technology, and super broad bandwidth and high-speed Internet access, into the existing IT applications at the *Center*;
- Additional funding sources will be developed to expand the capabilities of the Center to include such technology intensive and expensive capabilities as high definition television (HDTV);
- State agencies, institutions of elementary and secondary education, underserved populations, and other institutions and organizations will benefit greatly from access to digital image and information technology applications at the *Center*;
- Collaboration between other university programs will be promoted (e.g., the *UNO Film School*, *USC School of Cinema-Television*);
- Newly emerging IT and digital production companies will be “incubated” by the *Center*;
- Exciting new digital and information technologies will be developed through sponsored scientific research conducted by the *Center for Advanced Computer Studies* at the *Center for the Digital Moving Image*.

Making a Difference: The use of the moving image is increasingly pervasive in all segments of society. Its impact is exemplified in the film, television and music industries, in corporate training programs, in K-16 classrooms, and numerous other places. There is scarcely a single contemporary movie or video that doesn’t include sophisticated computerized and digitized moving images. Industry predictions are that within a few years, *all* movies will be produced *and* projected digitally—for better or worse virtually eliminating the use of film. Over the last several years there has been a growing awareness of the effectiveness of the moving image to communicate, to teach, to learn, and to sell. Industry has used graphics to deliver its message. It now understands that the moving graphic—the dynamic image—the moving image—has enhanced power. CD-ROM and DVD and their huge capacity for video along with the World Wide Web and Internet2 with their near universal access are increasingly utilizing the moving image and are dependent upon inventive technologies for streaming audio and video—the moving image. All of the design professions including architecture, interior design, industrial design, and advertising design benefit from high-level visualization, animation and virtual reality. Researchers in the biological sciences, including medicine, have benefited from the astonishing rate of innovations in imaging. The use of the moving image will change the way we teach and learn at every age, especially distance learning, adult continuing education and professional development. Innovations in all of these areas are essential to maintain our cutting edge in education and technology.

Project Site(s): The *Center* will be located on the campus of the University of Louisiana at Lafayette, housed on the third floor of the newly enlarged and renovated UL Lafayette Dupré Library. However, the outreach capability of the *Center* will extend across the state through the involvement of various project partners. Outreach will involve personal interaction with businesses, organizations and institutions throughout the state, in-house training, on-site internships, and multi-level web enabled access to the *Center's* technology and archival resources.

Users to be Served: End users of the *Center's* services will potentially include most citizens of the state. At a minimum, users will include businesses involved in the entertainment and information technology industries, state agencies, educational institutions and organizations, and community groups. In short, anyone involved with creating, selling, marketing or training with, learning from or simply viewing digital images produced directly or indirectly by the *Center* would be considered an end user.

Participating Partners: In addition to UL Lafayette and the LDED, participating partners will include: the UL Lafayette College of the Arts, Center for Advanced Computer Studies (CACS) and other University programs; the Louisiana Film Commission and its parent LDED Office of Entertainment Cluster Development; the LDED Office of Information Technology Cluster Development; the Lafayette Economic Development Authority (LEDA); the Lafayette Chamber of Commerce and its IT program, Zydotech; the Manufacturing Extension Partnership of Louisiana (MEPoL); filmmakers such as native Louisiana director Pat Mire; and local IT companies. A more complete description of the local Lafayette cluster Project Partners is available in the Appendix.

Technology to be Employed: The technology being applied includes state-of-the-art computer, Internet, media composition, motion capture, and DV editing and processing equipment. A more detailed description of these technologies is available in **Section G. Technical Approach**.

How the Technology Will Be Used: It is safe to say that every aspect of our lives is affected by the computerized moving image. What was once limited to the entertainment industry finds itself central to art, education, marketing, business and science. Its production is so sophisticated that solely the artist or solely the technician can no longer produce it. They are designed via a unique contemporary collaboration between artist and scientist—designer and programmer. It requires a partnership of the two. The *Center for the Digital Moving Image* will provide such a collaborative environment. This exciting *Center* will focus the university, the community and the state on the future as it becomes a valuable resource for the citizens of Louisiana.

B. Use of Innovative Technology

The word innovative does not begin to describe this project in terms of its potential impact on the State of Louisiana. Indeed, there are few examples anywhere in the United States of such programs sponsored by public dollars, despite the fact that DMI have become interwoven with the fabric of our society at all levels. One need only look at the phenomenal success of private sector companies involved with computer generated DMI, such as *Industrial Light & Magic*, *Dreamworks* and *Disney*, to see the potential impact that these technologies might have on our state economy, if creatively channeled through a public-private partnership such as the one envisioned here.

There is one important exception to this observation. As pervasive as DMI have become in today's society, a major barrier to public dissemination of such images over the World Wide Web has been the typically massive size of computer files associated with graphic images. For the most part, the bandwidth needed for high-speed transmission of streaming video images over the Internet has not been available. Downloading is often slow and impractical.

Fiber optic networks have expanded across the state, greatly increasing bandwidth transmission capacity. Lafayette, at the intersection of two major fiber optic network lines running along the I-10 and I-49 corridors, also offers the additional capacity of a fiber network recently completed within the city by Lafayette Utility System (LUS). These fiber networks dramatically increase the bandwidth available for Internet traffic and are a great inducement for IT companies to locate or relocate in this region. Lafayette offers great sites for such relocations, including the Research Park located on the main campus of UL Lafayette, and several industrial parks. According to site selection specialists,¹ there are three essential elements needed to be considered as an IT site for a company with a strong

¹ Source: Louisiana Department of Economic Development (LDED).

information technology component in their core business process: (1) access to digital communications (which the fiber networks provide); (2) access to a trained or trainable website work force (this is where the post-secondary education institutions come in) and (3) space - a building or property where a facility can be located. Lafayette possesses all three of these elements in great quantity. Not long ago, the Louisiana/Arkansas/Texas region was cited by Computer World magazine as the best region in the country for the creation of information technology jobs. Lafayette was cited as the 44th fastest growing technology market in the country by the Milken Institute, in a report it published in July 1999. And *Inc.* magazine cited Lafayette as the 13th strongest entrepreneurial climate among the nation's small metropolitan markets in December 2000.

Following the UL Lafayette lead, the cluster of cooperating institutions, businesses, organizations and service providers located in the Lafayette region, in close proximity to the fiber networks, gives our region the potential to grow and attract companies with strong IT components. With the trend of traditional brick-and-mortar companies moving to seize the opportunities for increased productivity and efficiency offered by IT investments, the Lafayette region has the potential to turn these assets into competitive advantage. UL Lafayette lies at the heart of an IT cluster with an infrastructure in place to expand the creation of exciting and innovative technologies.

However, the story gets even better. IT developers are poised on the brink of a dramatic IT revolution: ***nearly universal availability of wireless technology***. This IT will soon allow the high-speed transmission of data files tens and even hundreds of times larger than those currently transmitted over land lines, even the high-speed fiber optic networks. There is substantial evidence that streaming video markets, or custom infotainment portals, will be a huge segment of the IT industry over the next 10 years. This development will have an immeasurable impact on all aspects of DMI, from rendering to production to distribution, enabling the transmission of streaming media to wireless devices. Within several years streaming movies will be received on laptops or other devices through the air.

The growth of technology innovation has been exponential. Super high-speed transmission of information over the Internet is becoming a reality. By way of example, the *WorldCom* telecommunications company recently announced that new wireless Internet services are now available in Lafayette, one of only 13 cities worldwide where *Worldcom* is currently offering this service. This wireless service is thirty times faster than conventional dial-up DSL service.² Already in Europe, third generation wireless technology (3G) is a reality. This means that their cell phones can reach data rates of up to 384 kilobits/second (6 times faster than a dial-up 56k modem, 10 times faster than current cell phones). Soon, fourth generation wireless technology (4G), allowing data rates of up to 54 megabits/second to a device, will also be a reality (54 megabits/second is over 100 times faster than the fastest 3G technology).³

Once again, Lafayette is taking a leadership role. Several of the local IT companies partnering with the *Center for the Digital Moving Image* (David Goodwyn, ProTower) are at the forefront of this revolutionary development, and are working to create a test bed for 3G and 4G applications right here. The implications of these developments are astonishing. By funding the *Center for the Digital Moving Image* Project, the State of Louisiana is in the position of taking a national, even international, lead in the development of creative, and highly lucrative, ***content*** to be transmitted over these developing high-speed networks. In one swift move, the state can help businesses, institutions, organizations and citizens of Louisiana leap to the forefront of the IT revolution. There are nearly limitless possibilities for the miracles that might be produced for our state's economy, through such a public-private partnership, a marriage of two of the largest industries in the world: ***Telecommunications*** and ***Entertainment***.

C. Multi-agency Application or Portability to Other Agencies

According to the Louisiana Department of Economic Development (LDED), Louisiana is one region where adopting the cluster approach to development is imperative to future competitiveness. State officials have integrated the concept (as a geographic concentration of interconnected, competing and cooperating companies, suppliers, service providers and associated institutions, including government and universities) into Louisiana's long-term master plan for economic development, *Vision 2020*, and built it into the recent restructuring of LDED.⁴

² *Lafayette Daily Advertiser*, February 22, 2002.

³ Source: David Goodwyn, IT consultant and member of the Lafayette Chamber IT program, *Zydetech*.

⁴ Source: LDED.

Vision 2020 calls for a fundamental shift in the state's thinking about economic development towards focusing on two key points, **clusters** and **technology**, two integral elements of the *Center* project. Following the LDED restructuring into nine industry clusters, the *Center for the Digital Moving Image* Project involves close interaction with two of those cluster areas: **Entertainment** and **Information Technology**. The project proposes to combine elements of both through the interaction and collaboration of all the *Center's* partners to create a synergistic fusion of creative and innovative entertainment and telecommunications technology. LDED will collaborate closely with the *Center* in the implementation of this project, through its connection with institutions, organizations and citizens within clusters. The proposed *Center* will become a model for inter-agency partnership and participation.

For example, the Louisiana Film Commission (within the LDED Entertainment Cluster) currently produces a booklet of photos of various interesting sites around the state and makes it available to West Coast and independent film producers in order to attract their productions to the State. By creating and storing short video clips of these locations and making them available through streaming video over the web, the *Center's Production Location Resource Archive* will enhance the ability of producers and location scouts to make better-informed decisions about Louisiana sites.

By way of other examples, Dr. Ray Authement, President of the University of Louisiana at Lafayette, has for nearly thirty years been at the forefront of the development of a unique **social, cultural, economic, and technological** identity for this region by emphasizing the interrelationship between all the various entities in the region. Under his leadership, UL Lafayette has developed the region's **social** and **cultural** identity through such internationally recognized programs as the *Cultural and Eco-Tourism Center* and the *Center for Louisiana Studies*. UL Lafayette boasts one of only three Francophone doctoral programs in the world. UL Lafayette experts in Louisiana culture and folk-lore have been involved in numerous high-profile projects, including documentary film projects with noted film director Pat Mire, another of the *Center's* partners (see the Appendix for more details on participating partners).

UL Lafayette's leadership in **economic** development is evidenced by its relationship with the *Lafayette Economic Development Authority* (LEDA), headquartered in the University Research Park. LEDA exists to facilitate economic growth in Lafayette Parish and the surrounding area. Its joint LEDA-UL Lafayette partnership with the Lafayette Chamber of Commerce and the Chamber's technology program, Zydotech, has been a major factor in the region's technology-related economic growth in recent years.

The University's leadership in economic development is further evidenced by the *Manufacturing Extension Partnership of Louisiana* (MEPoL), also headquartered at UL Lafayette. MEPoL is an existing statewide program, providing business and technical assistance to Louisiana manufacturers in order to help Louisiana's manufacturers increase productivity and profits. The services MEPoL provides to Louisiana manufacturers include assistance in lean manufacturing, e-business, marketing, quality systems (ISO, API) and strategic planning. Providing DMI services through MEPoL is a natural extension of its mission. MEPoL will play an essential role in the outreach efforts of the *Center*, building bridges to emerging IT businesses.

UL Lafayette has taken the lead in **technology** growth in the region for decades. Growing out of a computer science program dating from 1962, the computer program was expanded in the 1980's to create what has become the world class *Center for Advanced Computer Studies* (CACS), a department of computer science and engineering devoted to both research and graduate-level education. CACS, and its internationally acclaimed research faculty and staff, have become another key part of Louisiana's advanced technology infrastructure. UL Lafayette is a major player in the field of telecommunications and is home to a NASA Regional Applications Center, one of four in the country. UL Lafayette's *Apparel Computer Integrated Manufacturing Center*, houses experts in developing business related technology solutions.

UL Lafayette's College of Education has long been involved in new educational technologies that have the power to unlock learning and promote academic success for students at all levels. They have developed interactive multimedia technologies for the exploration of complex knowledge domains where DMI can be used to illustrate abstract concepts, stimulate curiosity and engage the imagination. Additionally, the Louisiana Board of Regents and the Louisiana Governor's Office have funded research and development of interactive multimedia and electronic performance assessment systems.

Under the leadership of Dean Gordon Brooks, Project Leader for the *Center for the Digital Moving Image* Project, interagency collaboration is exemplified by the efforts of the College of the Arts to bring numerous individuals and

groups within the University and the State together in collaboration on the proposed project. In support of the project, the UL Lafayette College of the Arts has developed an imaginative fusion of artistic accomplishment and technological sophistication. In particular, the College has one of the premier computer animation curriculums in the country. The College animation curriculum includes videography, motion capture, and various types of computer generated and other digital images. Graduates of this program have gone on to careers with *Nickelodeon*, *Lucas Digital, Ltd.*, and other high-profile production companies in the US. The work done to establish this prestigious program forms the basis for the proposed expansion into the *Center*.

The College of the Arts also has the only baccalaureate Industrial Design program in a five-state region (LA, TX, AK, TN, MS). This four-year accredited professional program prepares students for successful practice in determining the form and aesthetics of a manufactured product, shaping it to fit the people who use it and the industrial process of production. Program support includes rapid proto-typing, vacu-form, casting and CAD-CAM equipment as well as an NC milling machine. The Industrial Design program has extensive experience in developing prototypes for use in CG and DMI production, and will be a major source of support for *Center* production work.

D. Benchmarking Partners and/or Best Practice References

It is difficult to describe successful implementations of the proposed project by other organizations and/or states. The unique nature of the proposed public-private partnership in entertainment technology has few parallels elsewhere. However, one example can be cited of an existing entertainment technology program that has experienced a high degree of success and profitability.

That program is the *Integrated Media Systems Center* at the University of Southern California in Los Angeles. This National Science Foundation sponsored program is an engineering research center for multimedia and Internet research. IMSC carries out a successful cross-disciplinary program of research, education, community outreach, industry collaboration and technology transfer.

As a leader in the multimedia and Internet field, IMSC has developed such unique immersive technologies as 3D face modeling and animation, Immersivision panoramic video technology, and Immersive Audio. Major progress is also being made in haptics (touch-related technologies), data compression and wireless communications. IMSC's integrated research approach is progressing toward Immersipresence, the *Center's* vision of the future of the Internet. IMSC views Immersipresence as the next great breakthrough in our digital era that will dramatically change our world within this decade, transforming our 2D world of computers, TV and film into 3D immersive environments in our living rooms - or anywhere. IMSC works closely with and supports other media related programs at the university and in the community, including the *USC School of Cinema-Television*.

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While not an exact comparison to the proposed *Center*, IMSC sponsored scientific research into cutting edge digital image technology is similar to the proposed involvement of the UL Lafayette *Center for Advanced Computer Studies* (CACS) in the *Center* project. CACS will support and extend the capabilities of the *Center's* technology through theoretical and applied research activities. Future funded research at CACS could produce technological breakthroughs in digital technology similar to those in the IMSC description. Just as the IMSC works closely with and supports the IT-related work of the *USC School of Cinema-Television* and other media and entertainment entities in California, so too will CACS work closely with and support the *Center for the Digital Moving Image*. Just as the centers at USC have produced a dynamic public-private partnership, coupling public allocations, grants and sponsored research with private investment and corporate sponsorship, so too will the *Center for the Digital Moving Image* achieve the same vibrant public-private partnership.

E. Long-range Planning

This project is closely aligned with and thoroughly implements the State of Louisiana's long-range economic development plan, *Vision 2020*. UL Lafayette's plan for development of the Center will work hand-in-glove with the *Vision 2020* plan, by focusing as closely as possible on the long-term goals of the Louisiana Department of Economic Development and its Entertainment and Information Technology Clusters.

Louisiana, as M.J. "Mike" Foster, Governor of Louisiana, has said, "...is committed to developing the infrastructure and the work force that will make our state conducive to technology-intensive businesses for decades to come." Businesses in Louisiana are, as Don J. Hutchison, Louisiana Secretary of Economic Development, has said, "...involved in both creating technology and maximizing the opportunities presented by technological change...universities and research centers [are] developing innovative processes and products, preparing a work force to use them, and training the innovators of tomorrow...[and] collaboration and cooperation among all contributors, is central to Louisiana's future."⁵

Louisiana's economic development master plan, *Vision 2020*, calls for the creation of innovative, knowledge-driven technology industry clusters to ensure sustainable growth. A 2000 report from the Milken Institute suggested that developing superior research facilities and educational institutions "are undisputedly the most important factor in incubating hightech industries."⁶

With the *Vision 2020* strategy in mind, the Louisiana Legislature set aside \$22.5 million in 2001 to begin an information technology initiative for higher education. State funding for technology-based education programs is expected to increase in the years to come. The current higher education initiative will fund an impressive series of enhancements—from infrastructure to faculty—aimed at positioning Louisiana's colleges and universities as national leaders in information technology education. UL Lafayette is taking a strongly aggressive and proactive approach to the development of IT in this region. This proposal is merely one of numerous examples of the university's technology-driven approach.

Taken together with technology efforts already underway at schools and colleges throughout Louisiana, the IT initiative will develop the educational infrastructure needed to pursue the goals and strategies of *Vision 2020*. From improved Internet access and more computers in the state's K-12 classrooms, to the emergence of world-class research parks and national leaders in biotech research at the state's universities, technology leadership is becoming the mantra of Louisiana's education system, and will be the guiding force behind the *Center* project.

Long-range University planning corresponds with the key principle underlying the higher education funding initiative, which was devised to correlate directly with the goals of *Vision 2020*, **collaboration**: connecting researchers to each other, connecting the state's work force to technology-intensive industries, and, above all, connecting research developments to the in-state resources that can successfully commercialize them.

The funding is allocated for upgrading a network that links the electronic resources, databases and research holdings at all state colleges, universities and public libraries; building an Internet2 backbone to connect the state's major research universities; enhancing equipment and laboratories; and hiring additional faculty.

Overall, the initiative is intended to add more than 150 new, nationally-recognized faculty to Louisiana in fields related to computer science, engineering, management and information systems, and information and decision sciences. UL Lafayette, and the *Center for the Moving Digital Image* will continue to work closely with the Louisiana Department of Economic Development to implement the long-range planning contained in *Vision 2020*.

⁵ Source: LDED.

⁶ Source: LDED.

IV. Performance Goals

During the initial five years of the *Center for the Digital Moving Image Project*, success will not simply be measured according to a static performance model that denotes whether tasks have been completed. Performance measures will also account for growth beyond the initial operational phase. Accordingly, the first two years funded by the Louisiana Innovation Technology Fund will feature five specific project goals, as described in Section IV.A.

Project Narrative. Each of these goals will be measured by one or more of the indicators and values presented below, during the first five years of the project.

Assessment of project goal outcomes will be based on three criteria:

Baseline (B=100 %): Degree to which project has established a **baseline** operational capacity for performance (e.g., percent of tasks accomplished in order for a specific deliverable to become operational).

Number (N=x): Number of **units** produced or **tasks** completed (e.g., number of digital images created or archived; number of services delivered; number of businesses served).

Baseline Expansion (B+=100+ %): Degree to which baseline operational capacity has been **expanded** or grown (e.g., additional funding has been acquired; equipment has been added; new techniques have been developed; new technologies have become available).

Project Goals will be measured according to the following performance goals, indicators and values:

| | |
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| G1. Studio: The <i>Center</i> will establish the <i>Digital Moving Image Studio</i> . | (B=100%) |
| G1a. Studio location and space prepared. | (N=X) |
| G1b. Equipment purchased and installed. | (N=X) |
| G1c. Staff and consultants contracted. | (N=X) |
| G1d. Studio operational procedures established. | (B=100%) |
| G1e. Collaborative links established. | (N=X) |
| G1f. CG and DMI projects produced. | (N=X) |
| G1g. Additional funds acquired. | (N=X) |
| G1h. Operations expanded. | (B+=100+%) |
| G1i. Permanent staff acquired. | (N=X) |
| G1j. Additional equipment purchased | (N=X) |
| G2. Services: The <i>Center</i> will establish CG and DMI training & TA program. | (B=100%) |
| G2a. Service and TA delivery contract negotiated with MEPoL. | (N=X) |
| G2b. Service and TA procedures established. | (B=100%) |
| G2c. Service and TA fees set. | (B=100%) |
| G2d. Service and TA program publicized in various sources. | (N=X) |
| G2e. MEPoL provides outreach contact to CG and DMI manufacturers. | (N=X) |
| G2f. Businesses and individuals served. | (N=X) |
| G2g. CG and DMI productions contracted. | (N=X) |
| G2h. CG and DMI projects produced. | (N=X) |
| G2i. Services provided to state agencies and nonprofit organizations. | (N=X) |
| G2j. Service delivery capacity expanded. | (B+=100+%) |
| G3. Research: The <i>Center</i> will establish scientific research program. | (B=100%) |
| G3a. Procedures established for research collaboration. | (B=100%) |
| G3b. Intra-institutional collaborative research links formalized. | (N=X) |
| G3c. Research projects are conducted. | (N=X) |
| G3d. Results and findings disseminated. | (N=X) |
| G3e. New research projects developed, new applications submitted. | (N=X) |
| G3f. New technologies developed and or accessed. | (N=X) |
| G3g. New CG and DMI procedures developed or improved. | (N=X) |
| G3h. Inter-institutional collaborative research links developed. | (N=X) |
| G3i. Research capacity expanded. | (B+=100+%) |
| G4. Archive: The <i>Center</i> will establish a digital image archive. | (B=100%) |
| G4a. Archival location and space prepared. | (N=X) |
| G4b. Existing Dupré Library digital image files consolidated. | (N=X) |
| G4c. Administrative support for archive coordinated with Dupré Library. | (B=100%) |
| G4d. Archive administrative and retrieval procedures established. | (B=100%) |
| G4e. CG and DMI produced by <i>Center</i> included in archive. | (N=X) |
| G4f. Web access procedures and protocols established. | (B=100%) |
| G4g. Access to WWW established. | (B=100%) |
| G4h. Numerous digital images collected for archives. | (N=X) |
| G4i. Production Location Resource Archive established on web. | (B=100%) |
| G4j. Production Location Resource Archive DMI collected. | (N=X) |
| G4k. New web technologies incorporated in archive procedures. | (N=X) |
| G4l. Archive expanded. | (B+=100+%) |

- G5. Sustainability:** The *Center* will establish a capacity for sustainability. (B=100%)
 G5a. Service fees will be collected. (N=X)
 G5b. Corporate sponsorship will be sought. (N=X)
 G5c. Economic development funding will be sought. (N=X)
 G5d. Production contracts will be negotiated. (N=X)
 G5e. Grant projects will be developed and proposals submitted. (N=X)
 G5f. Funding will be found for permanent staffing. (N=X)
 G5g. Funding will be found for new equipment acquisition. (N=X)
 G5h. Funding will be found for *Center* expansion. (N=X)

Performance Measures – Five Year Plan

| | | FY 2002-03 | FY 2003-04 | FY 2004-05 | FY 2005-06 | FY 2006-07 |
|--------------------------|------|--------------|------------|--------------|------------|-------------|
| G1. Studio | | B=100% | B+=110% | B+=120% | B+=130% | B+=140% |
| | G1a. | N=3600 sq ft | | N=2000 sq ft | | |
| | G1b. | N=28 | | N=10 | | |
| | G1c. | N=10 | N=8 | N=5 | | |
| | G1d. | B=100% | B+=105% | B+=110% | B+=115% | B+=120% |
| | G1e. | N=25 | N=50 | N=75 | N=85 | N=100 |
| | G1f. | N=10 | N=20 | N=25 | N=35 | N=50 |
| | G1g. | N=\$50K | N=\$100K | N=\$300K | N=500K | N= 700K |
| | G1h. | | B+=110% | B+=120% | B+=130% | B+=140% |
| | G1i. | | N=1 | N=2 | N=4 | N=5 |
| | G1j. | | N=3 | N=5 | N=5 | N=5 |
| G2. Services | | B=100% | B+=150% | B+=200% | B+=250% | B+=300% |
| | G2a. | N=1 | | | | |
| | G2b. | B=100% | | | | |
| | G2c. | B=100% | | | | |
| | G2d. | N=50 | | | | |
| | G2e. | N=25 | N=35 | N=45 | N=60 | N=75 |
| | G2f. | N=50 | N=60 | N=75 | N=100 | N=125 |
| | G2g. | N=2 | N=5 | N=9 | N=15 | N=20 |
| | G2h. | N=2 | N=5 | N=9 | N=15 | N=20 |
| | G2i. | N=20 | N=30 | N=50 | N=70 | N=90 |
| | G2j. | | | | | |
| G3. Research | | B=100% | B+=120% | B+=135% | B+=150% | B+=200% |
| | G3a. | B=100% | | | | |
| | G3b. | N=6 | N=9 | N=12 | | |
| | G3c. | N=5 | N=7 | N=8 | N=10 | N=12 |
| | G3d. | N=5 | N=7 | N=8 | N=10 | N=12 |
| | G3e. | | N=2 | N=5 | N=8 | N=12 |
| | G3f. | | N=1 | N=2 | N=2 | N=3 |
| | G3i. | | B+=120% | B+=135% | B+=150% | B+=170% |
| G4. Archive | | B=100% | B+=125% | B+=150% | B+=175% | B+=200% |
| | G4a. | N=1000 sq ft | | N=500 sq ft | | |
| | G4b. | N=65000 | | | | |
| | G4c. | B=100% | B+=105% | B+=110% | B+=115% | B+=120% |
| | G4d. | B=100% | B+=105% | B+=110% | B+=115% | B+=120% |
| | G4e. | N=2 | N=5 | N=10 | N=18 | N=25 |
| | G4f. | B=100% | B+=105% | B+=110% | B+=115% | B+=120% |
| | G4g. | B=100% | B+=125% | B+=150% | B+=175% | B+=200% |
| | G4h. | N=10000 | N=20000 | N=30000 | N=40000 | N=50000 |
| | G4i. | B=100% | | | | |
| | G4j. | N=25 | N=35 | N=50 | N=65 | N=90 |
| | G4k. | N=1 | N=2 | N=4 | N=6 | N=8 |
| | G4l. | | | B+=150% | | |
| G5.Sustainability | | B=25% | B=50% | B=100% | B+=150% | B+200% |
| | G5a. | N=25 | N=50 | N=75 | N=100 | N=150 |
| | G5b. | N=2 | N=3 | N=5 | N=8 | N=10 |
| | G5c. | N=\$200K | N=\$400K | N=750K | N=1 mil | N=\$1.5 mil |
| | G5d. | N=2 | N=5 | N=9 | N=15 | N=20 |
| | G5e. | N=3 | N=4 | N=5 | N=8 | N=10 |
| | G5f. | N=\$75K | N=\$150K | N=\$250K | N=\$400K | N=\$500K |
| | G5g. | N=\$1.5 mil | N=\$2 mil | N=\$2.5 mil | N=\$500K | N=\$500K |
| | G5h. | | N=\$150K | | N=\$200K | |

In addition to these outcomes, a number of other **Anticipated Outcomes** will also be produced within the first five years. The *Center* will not wait until Year Three to work toward delivery of these other outcomes, but will aggressively pursue appropriate opportunities as they arise. It is anticipated that the implementation of the first two

years of the project will produce many opportunities for growth and expansion in the *Center's* capacity accomplish its mission. In addition to the project goals specified above, the *Center* will anticipate the following additional outcomes:

- AO1.** Highly-trained digital image and IT professionals will choose to remain in Louisiana;
- AO2.** Economic development and job opportunities will be created;
- AO3.** Businesses and industries will take advantage of *Center* technical assistance resources;
- AO4.** Tourism and awareness of cultural identity will be enhanced;
- AO5.** New strategies will be developed to incorporate emerging DMI technologies;
- AO6.** Institutions, organizations and individuals will benefit from access to DMI and IT applications;
- AO7.** Collaboration between other university entertainment and IT programs will be promoted;
- AO8.** Newly emerging IT and digital production companies will be “incubated” by the *Center*;
- AO9.** DMI and IT sponsored scientific research will be conducted by CACS.

V. Technical Approach

Technical Description: Though this project proposes use of and creation of new technology, in the most simple terms, there are seven areas of technical work: (1) Creation of Digital Moving Images (DMI) using cameras in the field, on the set or in the studio; (2) Research on DMI processing leading to more accurate rendering of DMI scenes; (3) Creation of Computer Generated (CG) DMI using computer animation software on workstations in conjunction with a hard-wired motion capture system for realistic movement of animated characters; (4) Archival of moving and still images in conjunction with the UL Lafayette Dupré Library; (5) Research on data compression techniques and storage issues; (6) Research on data retrieval and analysis of image patterns; (7) Program production (post-production) using the AVID Media Composer non-linear digital editing system; (8) Creation of a Production Location Resource Archive and Web Site.

(1) Using cameras for video capture, video artists, educators, producers, manufacturers and users will create DMI stored on DV tape, according to standard industry practice.

(2) Research projects on image quality rendering capability will be conducted by the *Center* to enhance this process. A major concern of production and the use of digital images, outside the context of the *Center*, is the handling the dynamic range and the variations of lighting conditions in rendering and recording of a scene. In many moving image production scenarios, the lighting is the primary factor that determines how a viewer perceives what is depicted. Each pixel of a moving image, whether rendered by computer graphics software or recorded by a camera, represents the color information using a fixed number of shades. If the illumination overwhelms the allowed number of shades, details in the highlights or in the shadowed areas will be lost. Additionally, if the lighting condition changes because of time-of-day or weather variations, or if the exposure setting is changed to compensate for the illumination dynamic range, consecutive segments of a moving image document will not have the continuous appearance necessary for a user to perceive the continuity of the document.

Whether a scene is rendered or recorded, the color of a moving image document's pixel is formed primarily by the interaction of the scene illumination and the surface reflectance. Many imaging standards are based on using a fixed number, such as 256, shades of the three primary colors to represent each pixel. A problem that often arises is that the dynamic range of the illumination can be too large to be recorded or rendered using the allowed number of shades. Tone reproduction methods are used to handle scenes with large dynamic ranges. Using computer graphics tools, a scene is sampled to form a radiance map, which may exceed the capabilities of the display device or the recording media. When an actual scene is recorded, if the camera does not have the ability to record the scene dynamic range, the camera may make separate shots of the scene, adjusting the exposure settings to capture the details of both the highlights and the shadows. These separate shots are then combined to form a radiance map, which will be time varying for video data. This map can either be based on the camera frame or be based on the scene itself. In the latter case, the problem is similar to stitching together frames of a video sequence to form a panoramic view. The task of tone reproduction is to reduce the number of quantization levels of the radiance map to match that of the display device. It is a task similar to halftoning which reduces the number of levels drastically to facilitate printing. In tone reproduction, the main concern is to adjust the image and video levels within a frame so that all the details are rendered. Since the ultimate goal is to produce a rendering for a human viewer, tone

reproduction methods, just as halftoning methods, are developed based on some characteristics or models of the human visual system.

(3) Animation software and hardware will be used to create Computer Generated (CG) DMI for integration into the completed program. CG is used to achieve and illustrate scenes that are impossible to produce in any other way. For instance, CG is commonly used to create scenes of synthetic environments like another planet or a hazardous location such as a petro-chemical processing plant. These environments, if properly modeled, painted and lighted, are totally convincing on-screen. Using computer animation software on workstations in conjunction with a hard-wired motion capture system the artist and producer can create animated characters and objects that “track” the motion of the actors in the motion-capture studio yielding realistic and convincing movement. Again, this might be used to animate a character that is not real but also to manipulate a character that is dangerous or untrainable like an alligator. It can also be used for animating human characters performing dangerous stunts or even impossible movements that are rendered realistically.

(4) After the rendering or image capture is completed, the media product needs to be stored for future retrieval and use. This will be accomplished first by using the AVID editing system to digitize the DMI and to rough-catalogue into bins and folders. Then, the data is moved to the DMI and Still Image Archive that will be housed in the UL Lafayette Dupré Library. The Dupré Library has excellent resources for archiving and cataloging digital moving images and still images. Dupré Library has a long history of leadership in the state for acquisition and use of technology. It was the first library in the state to be fully automated and served as a model for the “Louis” system adopted by other state universities in Louisiana. It continues to lead the state in the use of electronic Internet/Web accessible resources. The library subscribes to tens-of-thousands on-line full-text journals via the Web of Science, Ebscohost and other resource subscriptions. For instance, Dupré Library’s subscription to the AMICO image resource provides more than 65,000 images of art works available to every student and faculty on the UL Lafayette campus or via the free UL Lafayette dial-up Internet access.

(5) As the *Center’s* archival data collection increases, methods and standards for compressing image and video data will be explored. There have been more research interests in the compression of three-dimensional (3D) surface mesh data due to the improvement in the facilities for data acquisition and rendering. An important problem is to develop a method by which a compressed surface can be incrementally decompressed as the part of the surface comes into view. The *Center’s* work on progressively compressing a surface undergoing motion can also be validated by the studio’s motion capture facilities. Watermarking methods embed data that can allow an author to prove ownership of a digital media document. While some works have been reported in watermarking images, more research issues remain in watermarking video and 3D surface data, especially when such data are subjected to compression.

(6) Capability for searching effectively depends on whether appropriate descriptions are made available. In some contexts, such as libraries, the process of creating such descriptions is referred to as cataloging. Often the descriptions provided by such catalogs are very shallow and allow searching merely by fields like author, title, etc. On the one hand, it is important to have a standard or convention that leads to a rich and detailed description of the resource. On the other hand, methods and tools are needed to not only create the descriptions according to the chosen standard, but organize and manage the descriptions in a way that information of interest to a given need can be found efficiently. In the context of large and complex data resources, such descriptions used are called metadata. A concerted effort in developing metadata standards and tools for creation of metadata according to those standards is a prerequisite to achieving the goals of effective search and of discovering significant patterns and relationships.

Once there exists a capability for querying and searching such a resource, it opens up opportunities for further analysis of the data in the archive via data mining algorithms specifically designed for this resource. In other words, it could be interesting to discover unexpected or interesting patterns of image sequences or motion sequences by application of suitable mining algorithms. For example, one may find the existence of certain characteristic shots that distinguishes entertainment movies from documentaries, or comedies from romantic stories.

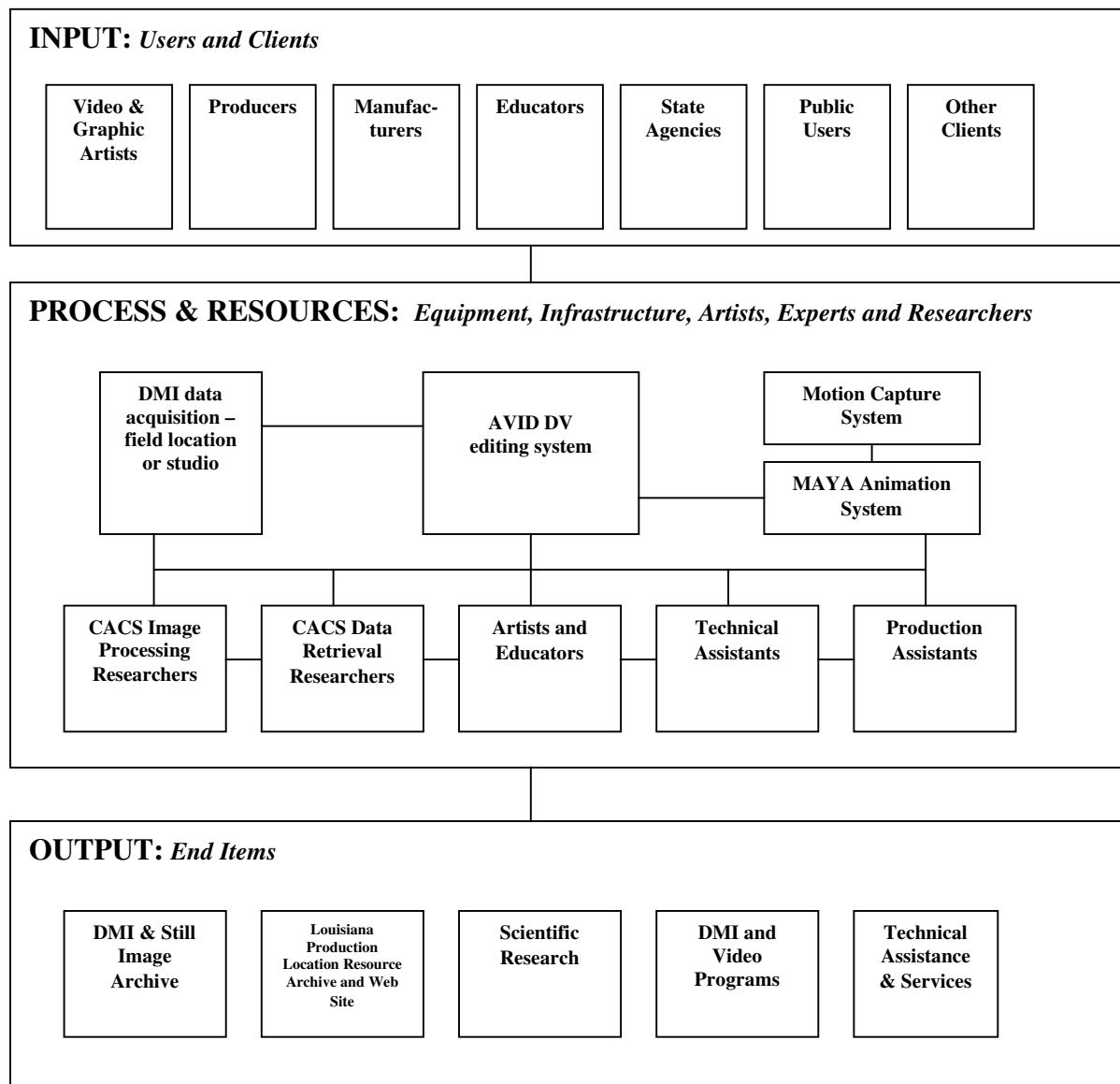
(7) Programs will be completed (post-production) using the AVID Media Composer non-linear digital editing system. This system, as mentioned, is a highly capable system that handles multiple streams of video and audio real-time and is capable of adding special effects to the program content for a polished final program. Notably, this system is the industry standard for broadcast and can accommodate film productions well because it can handle “edge numbers” necessary to produce an editing decision list (EDL) for final conforming of negative before printing

for data originally acquired on film and transferred to digital video for post-production. This “hybrid” production technique is almost universal in professional film production companies because of the economies of time and resources.

(8) One of the pilot projects for the *Center* will be the creation of a *Production Location Resource Archive* and Web Site for the State. This will be a dynamic, database information rich web site. Again, the UL Lafayette Dupré Library will assist in the maintenance the Archive and add DMI and other electronic resources as it acquires materials. This project will be accomplished in collaboration with and in conjunction with the Louisiana Film and Video Commission, Department of Economic Development.

The Center for the Digital Moving Image University of Louisiana at Lafayette

System Flow Chart



Interoperability: The equipment and software to be acquired for the *Center* will utilize current and popular standards and are compatible with already existing instructional facilities housed at the College of the Arts. In particular, DMI products developed will conform to well known standards such as MPEG7. A need is also envisioned for some special-purpose extensions to such standards. In such cases, the necessary additional software will be developed as a part of the research components of this proposal. Existing standards for metadata will also be carefully assessed in the light of interoperability requirements. The *Center's* goal in this respect will be to ensure that the facilities available at and products resulting from the *Center* will address the needs of all stakeholders and collaborators identified.

Scalability: The main area of growth and expansion is envisioned to be in the area of HDTV. The data rate requirements and storage capacity far exceeds the existing DV video requirements to the extent that it is extremely ripe for research potential. Also, the costs for HDTV equipment are exponentially more than DV. The *Center*, through future grants and funded projects, will acquire the infrastructure to produce in HDTV resolution (1080p) and will attract a whole new group of DMI producers to Louisiana and the region. Equipment (cameras, recorders, editing stations, storage facilities) is so much more expensive that it is unlikely that independent producers in the State will own such equipment. Louisiana Public Broadcasting (LPB) will undoubtedly move towards HDTV production for their own use since they have the capacity and mission to broadcast in that medium. But because their mission does not include the *Center's* goal of offering use of technology, infrastructure and professional expertise to state professionals in order to create and support an industry for economic development, the *Center* will become the most important support structure and probable location of future HDTV production in Louisiana.

There are a number of potential projects that would promote future growth. For example, professionals in the State have recently approached the University requesting technical assistance. However, the University currently lacks the equipment and infrastructure to fully assist with these projects and, without the establishment of the *Center*, these Louisiana companies may be forced to seek assistance elsewhere outside the state.

Briefly, these two projects are:

1. *Swamp Things – Family Tree Entertainment*, and independent television Production Company in Baton Rouge, approached the University for assistance in producing a pilot for a 26 segment series for national broadcast on the ecosystem also known as wetlands or marshes. They intend to use the Atchafalaya Basin as the location in this nationally syndicated television production. Their marketing plan is targeted at the Discovery Channel and other cable outlets. The video treatment includes a live on-camera host who interacts with an animated character, *Andy Ant*. No one in the State of Louisiana offers a degree program in computer animation except UL Lafayette College of the Arts. Though the college teaches the technology and ability to assist with the pilot, it does not have the infrastructure to legally produce the animated character for the pilot. The proposed *Center* would own commercial licenses and have the infrastructure to assist this production company secure the contract they seek.

2. "*Rhythm Nation*" – *Pal Productions, Inc.*, in Baton Rouge, has approached the University for assistance in producing a pilot for a 26 segment series for national broadcast that is centered on the music of the South especially the regional music of Louisiana. This will be a production that will combine some of the features of *Austin City Limits*, *VH1-Storytellers* and *Saturday Night Live*. They intend to involve students from around the state, especially from UNO Film School, LSU Communication Department and the UL Lafayette College of the Arts Visual Arts animation program. Again, although the College of the Arts teaches the technology and has the infrastructure for instruction, it is unable to participate at this time due to the restrictions of current licensing agreements with *Alias/Wavefront*, distributors of the animation program MAYA and the infrastructure necessary for such projects.

The foundation underlying *Center* activities (utilizing networking and access capabilities) will be based in the considerable competitive advantage for schools, businesses and citizens in utilizing developed applications in this area. The proliferation of Internet access is just the first step. Advances in broadband access and developments in mobile networking will prove to have more true and enduring impact on economic development.

Convergence of voice, video and data, all over Internet Protocol (I.P.), will reduce the cost of most communications to the point of little sensitivity to distance or time. Critical mass will be achieved when portions of the current economy are transformed from consumers to producers through advances in networking applications. The economies of this group of networking applications make it possible for every individual, home, or business to be a producer, a provider of services in the network economy.

Applications such as distance learning and telecommuting over secure broadband from remote locations will prove to have a greater impact on the economic status quo than the initial proliferations of market economies. A major emphasis for the *Center*, as it grows, will be continued accessibility by public users to archival digital image data. High-speed acquisition of images can only be facilitated through efficient retrieval of data. It is envisioned that, over time, a large variety and number of segments or shots of digital moving image documents will be produced. Since one of the goals of compiling and archiving such a resource is to facilitate the re-use of existing segments, not only by combining or superimposing archived shots but also by combining existing ones with newly created segments, the problem of knowing what is in store and how to find those documents or segments thereof that are of interest at a given time is a challenge. Thus some kind of search capability needs to be properly integrated with the production and editing tools. While existing technologies provide reasonable mechanisms to search for frames or segments within a movie, current mechanisms are inadequate for coping with a large database of such moving images. This will certainly be an important area of research in the future.

Maintaining the System: System maintenance will be coordinated by technicians in existing positions within the UL Lafayette College of the Arts, Center for Advanced Computer Studies, and campus Computing Support Services. In addition, consultants will be contracted as needed to assist in maintenance and upgrade of the system. The *Center* will contract with service providers to assist in supporting the continued accessibility of *Center* resources to future high-speed wireless Internet capabilities, as these systems become available.

VI. Implementation Approach

Project goals during the first two year and beyond, as described in Section IV.A. **Project Narrative**, will include the following:

- G1. Studio:** The *Center* will establish the *Digital Moving Image Studio*.
- G2. Services:** The *Center* will establish CG and DMI training & TA program.
- G3. Research:** The *Center* will establish scientific research program.
- G4. Archive:** The *Center* will establish a digital image archive.
- G5. Sustainability:** The *Center* will establish a capacity for sustainability.

Anticipated outcomes over the course of five years include:

- AO1.** Highly-trained digital image and IT professionals will choose to remain in Louisiana;
- AO2.** Economic development and job opportunities will be created;
- AO3.** Businesses and industries will take advantage of *Center* technical assistance resources;
- AO4.** Tourism and awareness of cultural identity will be enhanced;
- AO5.** New strategies will be developed to incorporate emerging DMI technologies;
- AO6.** Institutions, organizations and individuals will benefit from access to DMI and IT applications;
- AO7.** Collaboration between other university entertainment and IT programs will be promoted;
- AO8.** Newly emerging IT and digital production companies will be “incubated” by the *Center*;
- AO9.** DMI and IT sponsored scientific research will be conducted by CACS.

The *Center* will aggressively pursue all the goals and anticipated outcomes as opportunities present themselves. It is anticipated that implementation of the project goals during the initial two-year pilot project will create opportunities that will foster other anticipated outcomes, some foreseen and some unforeseen. The activities and outcomes of the two-year pilot project will result in growth that will support the continued program of the *Center* in years following. The basic approach to project implementation will be to engage in all activities that promote and support economic development, artistic creativity, scientific discovery, technology innovation and cultural identity for the State of Louisiana. The *Center* will follow the long-term plan of the state, as described in *Vision 2020*.

It is expected that project implementation will follow the timeline presented below.

Project Implementation Timeline

| | FY 2002-02 | | | | FY 2003-04 | | | | FY 2004-05 | | | | FY 2005-06 | | | | FY 2006-07 | | | |
|------|------------|----|----|----|------------|----|----|----|------------|----|----|----|------------|----|----|----|------------|----|----|----|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| G1. | | | | | | | | | | | | | | | | | | | | |
| G2. | | | | | | | | | | | | | | | | | | | | |
| G3. | | | | | | | | | | | | | | | | | | | | |
| G4. | | | | | | | | | | | | | | | | | | | | |
| G5. | | | | | | | | | | | | | | | | | | | | |
| AO1. | | | | | | | | | | | | | | | | | | | | |
| AO2. | | | | | | | | | | | | | | | | | | | | |
| AO3. | | | | | | | | | | | | | | | | | | | | |
| AO4. | | | | | | | | | | | | | | | | | | | | |
| AO5. | | | | | | | | | | | | | | | | | | | | |
| AO6. | | | | | | | | | | | | | | | | | | | | |
| AO7. | | | | | | | | | | | | | | | | | | | | |
| AO8. | | | | | | | | | | | | | | | | | | | | |
| AO9. | | | | | | | | | | | | | | | | | | | | |

In addition to the outcomes enumerated above, a research agenda is also envisioned by investigators and the *Center for Advanced Computer Studies*, in support of the Center. Examples of proposed research projects include:

- Develop XML-based standards for representing metadata for databases consisting of digital moving images.
- Design and develop tools for automatically and semi-automatically creating metadata, according to the standards above.
- Develop and implement mechanisms for searching digital movie database by appropriate structuring and organization of the metadata database associated with the movie database.
- Integrate the search tools with tools acquired for digital movie authoring and editing. In addition, make such search tools accessible via the Internet.
- Embed search tools within sophisticated algorithms intended for analyzing metadata database as well as digital motion data, in order that important patterns and relations can be discerned and delivered to movie producers as knowledge. Such knowledge is expected to be valuable in planning and executing movie authoring projects.
- Implement tone reproduction algorithms based on a multiresolution human visual system model
- Develop a time-varying radiance map and extend tone reproduction algorithm to handle video data sets
- Develop progressive compression and watermarking algorithms for 3D moving surface data sets

VII. Assessment of Risks

This project, because of its collaborative nature and important mission inherently has few risks. The participants' and partners' missions, histories and people assure the long-term success of the project. The most notable risk of the project is the fact that funding is not allowed for permanent management, technical and creative full-time employees. This limitation is mitigated by the part-time contributions of the researchers, artists and project manager paid by the University and the inclusion in the budget funds for consultant services personnel and travel.

The Center will aggressively seek to provide services to clients who will, in turn, provide a revenue stream to maintain its activities and equipment. The Center will also seek funding from national agencies such as the

Economic Development Administration to increase the capacity of its services, especially in the area of HDTV. The success of the Center is assured because of the commitment of UL Lafayette, its administration, artists and researchers, and the commitment of its partners, the Louisiana Department of Economic Development, the Lafayette Economic Development Authority, the Lafayette Chamber of Commerce and its IT program, Zydotech, and many other institutions, organizations and individuals within the Acadiana regional information technology cluster. Their commitment to provide the technology, infrastructure, professional expertise and resources to State professionals, agencies and organizations in order to maintain economic growth in the region and State affirms our belief that the Center for the Digital Moving Image will be a sustained enterprise for the future of Louisiana. It is felt that Lafayette is the right place, at the right time, to establish a program that will foster creative scientific research and artistic accomplishment, streamline the delivery of services to citizens, train workers for high technology employment, create jobs and keep them here in the state, and generate revenue in a cost-effective manner.

VIII. Integration with Existing Technologies

Existing capability in the UL Lafayette College of the Arts in the area of CG and DMI:

In addition to the twenty seats of Alias/Wavefront MAYA, the eight PC “render-farm” and five non-linear digital editing suites, the College of the Arts has the following studios and equipment for producing DMI.

- The existing video studio is equipped with two studio cameras and a broadcast style switcher. This studio also contains two digital mixers each with effects generators. This studio is used primarily for image capture for “blue-screen” for compositing models, actors and other objects used in the production process.
- The Digital Audio Studio is state-of-the-art equipment for editing sophisticated sounds and has a full complement of DAT equipment for studio as well as portable field recording of sounds and performances. High quality microphones and a multi-channel digital mixing board complete this audio studio.
- The “Electronic Theatre” is a 130 seat auditorium space with a full stage for theatrical and performance art productions. It is equipped with a sophisticated theatrical lighting system as well as a capable audio system that is Dolby 5.1 capable and includes a 24 channel digital mixing board. The facility includes a high quality digital video and data projection system that can project SVHS, BetaSP, DVD and computer data to a screen 12’X24’. Notably, the room is equipped with a 24-screen video-wall used for performance art and large-scale image display. The control system has its own digital processing system for dividing the image on the screen. The room is also equipped with a 12-screen video-chase system to augment the 24-screen video wall. There is no other facility in the state that is as well equipped for mounting performance art works.

The UL Lafayette *Center for Advanced Computer Studies* (CACS), as a world-class computer science and computer engineering program, offers numerous types of technology system support for IT and DMI research. CACS operates a large variety of computer equipment for use by its faculty, staff and students. The computer facilities are available twenty-four hours a day, 365 days a year. An extensive ethernet network connects computers and peripherals in the department to the campus data network, OUNET, and in turn to the Internet.

The primary computer systems are Sun Microsystems SPARCstations. The center operates approximately ninety Sun workstations. There are about twenty-five workstations available for graduate students' use. The remaining Sun workstations are in dedicated research laboratories. CACS workstations are served by seven file servers with mass data storage capacity.

In addition to the workstations that are available for general use the center operates numerous peripherals. Users have access to laser printers, color printers, and color pen plotters.

Of particular note for research associated with the *Center* project, the Computer Vision and Pattern Recognition Laboratory is presently equipped with six major pieces of hardware:

- A dedicated image acquisition and analysis system based on ITI-150 series hardware from Imaging Technology Inc. The current configuration permits acquiring images through up to four dedicated RS170 compatible cameras. The workstation is connected to the CACS local area network.

- A White Scanner, laser-based range imaging system, from Technical Arts Inc., Seattle, WA. The testbed is a X-Y motion controlled platform which can be positioned with an accuracy of 0.001 inches. Objects of size up to 10" by 10" may be placed on the testbed, and the Z-depth is measured with an accuracy of 0.001 inches.
- A 32-node, MIMD parallel computer from Cogent Research Inc. Its operating system is QiX. The parallel program development environment is Kernel Linda; and the primary language is C++. This machine is also available on the CACS local area network, and serves as an X-Client.
- Newport Inc. optical bench/support frame to facilitate controlled lighting and mounting of objects for experimental setups. The bench offers a workspace of: 6' x 3' mounting holes at 1" x 1" intervals.
- A Sun SPARC station, 10 color workstations connected to the CACS network. The software support includes: mathematica, MACSYMA, MATLAB.
- The software environment is based on UIDAS, USL's image data analysis software, which is designed to work with Xwindow, and IBM PC, MS-windows.

Additional technology support is present in the form of the campus computing system, which maintains the IBM mainframe system, ISIS, the administrative database, LIBIS, the online library catalog, and MVS accounts for administrative and special academic users. Technology applications at the Center, including web-based access to the archive, will be coordinated with campus Information Networks. The IBM computer system has the following hardware specifications:

- IBM 9672 processor (installed June 1995)
- dual processor unit (29+ MIPS)
- 104 gigabytes of disk space
- four 7171 controllers to support ASCII terminals
- one 3172 TCP/IP controller

H. Project Budget and Costs

1. EQUIPMENT

STT Simtechniques Motion Capture System which will cost \$60,000. Since hardware costs typically are lower than quotation, this may be upgraded from a "hard-wired" system to a "wireless" system.

Lighting Equipment for Motion Capture Studio that will cost \$10,000. This is necessary in order to assure high level lighting if the wireless "tag-video-tracking" system is procured.

Miscellaneous software and hardware associated with the motion capture system is estimated to cost \$10,000. Typically, there are hardware and software accessories that will enhance the system.

Avid Media Composer Non-linear Digital Video Editing System will cost \$125,000 turnkey. This will include the software, firmware internal boards, accelerators, monitors, cables and the computer.

Network Mass Storage System will cost \$15,000. This storage system will be network shared by the editing system, the DMI and Still Image Archive as well as the Louisiana Production Location DMI Archive and Web Site.

DV BetaCam Editing Deck will cost \$42,000 and is used to deliver DMI data to the editing system and to record completed programs for duplication and distribution.

DV BetaCam Play Deck will cost \$28,000 and will be used to deliver DMI to monitors and projectors in the CDMI for demonstrations to clients and producers and for artists to view products.

HDTV Projection Monitor: One (1) Sony 65" HDTV Projection Monitor will cost \$6,000 and will be used for artists, clients and users to view program material.

PC Workstations: Three (3) computers will have Alias/Wavefront MAYA animation software installed to create animation sequences. These workstations are capable of accepting data from the motion capture system to animate the objects and characters.

Workstation/Server w/ HD Storage: One (1) workstation will act as a server and also an animation workstation. It will have sufficient storage for use in the studio without accessing the DMI Archive.

PC Renderfarm: Ten (10) dual-processor rack-mounted PC workstations or one “high-density blade server” to serve as a rendering cluster to improve through-put for the “rendering bottleneck.”

Desktop Computers: Five (5) desktop computers w/ Microsoft Office for administration of Center at a cost of \$11,500.

Laser Color Printer: One color printer will cost \$2,100.

| <u>Fund Category</u> | <u>Qty</u> | <u>Unit Price</u> | <u>Total</u> |
|----------------------------------|------------|-------------------|--------------|
| STT (Simtechniques) MCS | 1 | \$60,000 | \$60,000 |
| Studio Lighting Equipment | 1 | \$10,000 | \$10,000 |
| Misc. Software Associated w/ Sys | 1 | \$10,000 | \$10,000 |
| Avid Media Composer | 1 | \$125,000 | \$125,000 |
| Offline Storage System | 1 | \$15,000 | \$15,000 |
| DV BetaCam Editing Deck | 1 | \$42,000 | \$42,000 |
| DV BetaCam Play Deck | 1 | \$28,000 | \$28,000 |
| 65" HDTV Projection Monitor | 1 | \$6,000 | \$6,000 |
| PC Workstations | 3 | \$5,730 | \$17,190 |
| Workstation/Server w/HD Storage | 1 | \$12,000 | \$12,000 |
| PC Render Farm | 10 | \$6,000 | \$60,000 |
| Desktop Computers | 5 | \$2,300 | \$11,500 |
| Laser Color Printer | 1 | \$2,100 | \$2,100 |
| TOTAL | | | \$398,790 |

2. SOFTWARE

Alias Wavefront MAYA Animation Software: Four (4) commercial licenses for animation and compositing DMI will cost \$30,000.

Library and Resource Materials: The Center will provide an annual amount of \$5000 to the Dupré Library for procurement of software and print materials for a comprehensive resource collection on DMI research materials. This will include CD-ROMs, DVDs and other DMI materials.

| <u>Fund Category</u> | <u>Qty</u> | <u>Unit Price</u> | <u>Total</u> |
|-----------------------------|------------|-------------------|--------------|
| Maya Animation Software | 4 | \$7,500 | \$30,000 |
| Library and Resource Mat'ls | 2 Yrs. | \$5,000 | \$10,000 |
| TOTAL | | | \$40,000 |

3. TELECOMMUNICATIONS

Telephone Equipment: Telephone equipment for office and general communication will cost \$1,500.

Network Connections: Eight (8) network drops will cost \$5,600.

| <u>Fund Category</u> | <u>Qty</u> | <u>Unit Price</u> | <u>Total</u> |
|----------------------|------------|-------------------|--------------|
| Telecom Equipment | 1 Yr. | \$1,500 | \$1,500 |
| Ethernet Drops | 8 | \$700 | \$5,600 |
| TOTAL | | | \$7,100 |

4. PROFESSIONAL SERVICES

Professional Services Personnel: Eventually, the Center will be managed by full-time employees. Initial project will require professional services to manage and implement the research and services outlined in the proposal.

| <u>Fund Category</u> | <u>Qty</u> | <u>Unit Price</u> | <u>Total</u> |
|-------------------------------|------------|-------------------|--------------|
| Consultant Services Personnel | 2 Yrs. | \$160,000 | \$320,000 |
| Consultants Travel | 2 Yrs. | \$7,000 | \$14,000 |
| TOTAL | | | \$334,000 |

5. OTHER COSTS

Initial operation of the Center will be born by University faculty and administrators. The Project Director, Gordon Brooks, will contribute ten per cent of his time and effort to the project, as will several others as the chart below indicates. The University pays their salary, benefits and indirect expenses.

| <u>Fund Category</u> | <u>Qty</u> | <u>Unit Price</u> | <u>Total</u> | <u>UL Lafayette</u> |
|--|------------|-------------------|--------------|---------------------|
| Personnel | | | | |
| Gordon Brooks (PI) (10%) | 2 Yrs. | | | \$18,600 |
| David Jackson (Co-PI) | 2 Yrs. | | | \$11,193 |
| Vijay (Co-PI) (10%) | 2 Yrs. | | | \$23,400 |
| Henry Chu (Co-PI) (10%) | 2 Yrs. | | | \$16,999 |
| Yoon (Co-PI) (10%) | 2 Yrs. | | | \$14,117 |
| Yeon Choi (Co-PI) (20%) | 2 Yrs. | | | \$15,889 |
| Robert Russett (Co-PI) (10%) | 2 Yrs. | | | \$13,293 |
| Benefits (23%) | 2 Yrs. | | | \$52,206 |
| University Indirect Costs | 2 Yrs. | | | \$41,424 |
| Facility Prep and Operating Costs | | | | |
| Sq Ft Space Preparation | 3600 | \$50 | \$180,000 | |
| Operating and Misc Expenses | 2 Yrs. | \$20,000 | \$40,000 | |
| TOTAL | | | \$220,000 | |

V. Funding Requested

| <u>Fund Category</u> | <u>Total Cost</u> | <u>Other Sources</u> | <u>Funding Requested</u> |
|-----------------------|-------------------|----------------------|--------------------------|
| Equipment | \$398,000 | | \$398,000 |
| Software | \$40,000 | | \$40,000 |
| Telecommunications | \$7,100 | | \$7,100 |
| Professional Services | \$334,000 | | \$334,000 |
| Other | \$261,424 | \$207,121 | \$220,000 |
| TOTAL | \$1,207,011 | \$207,121 | \$999,890 |

VI. Cost/Benefit Analysis

The unique nature of the Center project makes it difficult, if not impossible, to establish a baseline cost-savings analysis or cost/benefit ratio. As a new pilot project, there are no existing positions funded or work to be done for which to estimate cost savings. There will be no tangible increase or reduction in the current operating expenses of the project or the agencies involved, in comparison to operations prior to the project. Furthermore, there are few comparable programs anywhere on which to base comparisons.

Can an estimate of benefits be made? Yes.

If the project is funded, the following benefits are anticipated:

Computer graphic and digital moving image technology training and technical assistance services will be delivered to citizens of the state in a cost effective manner. The Manufacturing Extension Partnership of Louisiana (MEPoL) will give manufacturers access to technology equipment and infrastructure for training and management programs that will increase sales, utilize resources more effectively, and improve productivity. MEPoL is an established federally-supported service provider and broker already effectively serving the manufacturing community. This use of Federal dollars to assist in this state-supported enterprise will be a highly beneficial cost saving.

The *Center* will generate service fees for delivery of services. While the *Center* will not compete with existing business and industry for service contracts, the technology funded by this project will bring a resource to the state previously unavailable, making it a valuable commodity. Institutions, organizations and businesses throughout the state will find this resource useful and will be willing to pay a service fee for its use. Corporate sponsors may be recruited to invest in the *Center*. Potential exists for numerous grant-sponsored projects. Film projects in collaboration with filmmakers such as Pat Mire will bring funding into the Center. It is estimated that, not only will the *Center* be self-supporting within several years, but its net proceeds may actually one day become a revenue generator for the state. Opportunities are already being missed. Production projects have been brought to UL Lafayette that cannot currently be fully supported with existing infrastructure and equipment (see P. 13, **Section V. Technical Approach: Scalability**). The proposed *Center* could easily accommodate these projects, keeping economic development opportunities here at home in Louisiana.

Projects produced by the *Center* will produce cost savings. For example, the *Production Location Resource Archive* to be developed using DMI to promote Louisiana to the film/video/television/music industry in collaboration and conjunction with the Louisiana Film and Video Commission located within the LDED Office of Entertainment Cluster Development will produce cost savings for that agency. LDED currently spends money to produce printed brochures to highlight film locations. The Production Location Resource Archive will be a better, more cost-effective way to reach prospective filmmakers. It will allow filmmakers to easily view video of possible film locations, a far more preferable approach.

The Center will produce trained professionals who may choose to “telecommute” to out-of-state jobs rather than relocate to other states where DMI work is currently done. Film companies may choose to use these in-state facilities for support while filming here, rather than send work out-of-state. Numerous businesses will find the video archive resources developed at the Center to be a valuable resource for advertising, sales, marketing, and training purposes. These are all potential cost-effective practical applications for this innovative technology for which is would be difficult to estimate in advance of the project.

Appendix

Principal Participating Partners of the *Center* from the Lafayette regional cluster include:

UL Lafayette College of the Arts

The College of the Arts is the Lead Partner in this project. The College is a multi-disciplinary academic unit that combines all of the design arts, visual arts and performing arts into one multi-faceted whole. The vision of the College is to be known for its infusion of technology in the arts, its recognition of the collaborative nature of the arts, and its outreach to the State and the region.

Dean Gordon Brooks is the Project Leader. Mr. Brooks is nationally recognized for his visionary contributions to architectural education, for his leadership in public education through public television programming, and for forging connections between disciplines. He has produced and directed seven documentary videos for PBS on architecture. He has held numerous offices in professional and community organizations and has served on the boards of AIA Louisiana, Downtown Lafayette Unlimited, Acadiana Symphony Orchestra and Louisiana Public Television.

Mr. David Jackson is Department Head for Visual Arts. He is a photographer and computer artist and animator. He has authored several successful BORSF grant proposals and is a key member of the College of the Arts team for technology in the arts.

Mr. Robert Russett and Ms. Yeon Choi are faculty in the Visual Arts department. Mr. Russett is an animator and video artist. He is internationally recognized as a leader in experimental film and video and his films are held by some of the most prestigious museums and galleries in the world. Ms. Choi is a computer artist and animator. She has had work accepted by the SIGGRAPH world-wide computer graphics annual conference.

The Louisiana Film and Video Commission and its Director, Mr. Mark Smith, Esq., are participating in this project. The Commission will act as the client and provide guidance for the development of the Louisiana Production Location Archive and Web Site.

The Department of Economic Development's Entertainment Industry Cluster and Director Lonny Kaufman will participate in the project and assist the Center identify potential clients and others needing assistance.

Center for Advanced Computer Studies (CACS)

Long before computing became the dominant technology of the twentieth century, UL Lafayette made a decision to grab the tail of this comet as it began to streak across the sky. In 1962, Purdue was the first university to establish a computer science department. That same year, the nation's first Masters of Science program in computer science was initiated – at UL Lafayette. The Ph.D. program in computer science was established in 1968, the first such program in Louisiana. For the next 16 years computer science grew as UL Lafayette's flagship program. In 1984, the Center for Advanced Computer Studies (CACS) was formed by consolidating the graduate programs of computer science and computer engineering. Today, CACS enjoys a leading international reputation. CACS collaborates closely with other science and engineering programs at UL Lafayette, including the prestigious Department of Electrical and Computer Engineering.

Over the years, CACS has hosted a distinguished faculty, including three IEEE Fellows. Several faculty are editors or associate editors of prestigious journals. Over a three-year period (July 1, 1997 to June 30, 2000) CACS was awarded \$5.44 million in external funding for research, with over 25 grants and contracts with government agencies and industry. In 1997-98 CACS faculty published forty-four journal papers, sixty-nine conference papers, four books, and four book chapters. Annually, CACS faculty serve as general chairs or program chairs for national or international conferences. Some of these conferences are brought to Louisiana (and UL Lafayette). CACS annually averages more than 150 graduate students in its two graduate programs. Within the last five years, CACS annually produced an average of forty-nine MS and nine PhD graduates in computer science, and twenty-two MS and five PhD graduates in computer engineering per year.

Manufacturing Extension Partnership of Louisiana (MEPoL)

MEPoL was designated by the U.S. Department of Commerce as the Manufacturing Extension Partnership of Louisiana to offer business, management, and technical assistance to the 5,000 small- and medium-sized manufacturers throughout the state. It is affiliated with the Manufacturing Extension Partnership (MEP), a national network to assist small manufacturers to be globally competitive. MEPoL is housed in the Louisiana Productivity Center. MEPoL has formed partnerships with universities and organizations throughout the state to provide reduced-cost assistance to Louisiana manufacturers. The services provided by MEPoL come from internal staff expertise, national expertise from the Manufacturing Extension Partnership network, and expertise provided by private and public organizations throughout Louisiana that have agreed to reduce their normal rates to MEPoL clients. The reduced rates help smaller manufacturers obtain assistance they otherwise may not have been able to afford.

Lafayette Economic Development Authority (LEDA)

LEDA is a resource for businesses and economic development throughout the region. LEDA assists in the development of basic business plans and the utilization of finance, incentives, marketing, etc., to assist small, minority and woman owned businesses. LEDA is the only ISO 9000 certified economic training program in the country. LEDA hosts the Chamber of Commerce IT program, Zydetechn, and is a key component of the information technology cluster in this region.

Lafayette Chamber of Commerce

The Greater Lafayette Chamber of Commerce is the leading force in the improvement of the business environment, the economic health, and development and prosperity of the region. Investors elect a board of directors that sets policy. The board employs a seven-member, professional staff that drives programs and activities for the membership. Investors with specific interests volunteer for standing committees. Members have an opportunity to do their most effective networking at monthly Business After Hours, quarterly VIP Coffee programs and other special event mixers. Held each month at different business locations, Business After Hours is a great way to develop new business contacts.

The Chamber sponsors an initiative for IT businesses in the region called **Zydetech**. Its mission is to develop and maintain Lafayette's ability to compete globally in the Knowledge Economy. It is the vision of Zydetech to have a technologically inspired community of business, government and education that excels in a dynamic environment...the new Knowledge Economy. This requires Zydetech to encourage a competitive environment that promotes the greatest access to and value from technology. Zydetech advocates the technology perspective at all levels of the community including government, education and business.

Pat Mire, Director

Pat Mire is an award-winning documentary filmmaker. Mire's cultural documentaries have been broadcast nationally on PBS, the Discovery Channel, and TNN's American Skyline and have won the highest awards in the most prestigious national and international competitions including the Margaret Mead Film Festival, Worldfest Houston, and the American Anthropological Film Festival where he received the coveted Award of Excellence. Mire and his films have been the subject of numerous articles and reviews in major magazines, newspapers, and journals. Carl Lindhal, film reviewer for the *Journal of American Folklore*, called Pat Mire "an important artistic force at work in French Louisiana whose camera work and editing are excellent." Lindahl's review compared Mire to legendary documentary filmmaker Les Blank.

Recognized for his creative film making skills, Pat Mire received a 1991 regional fellowship from the Southeast Media Fellowship Program. In December 1993, the Louisiana Endowment for the Humanities honored Mire with a Special Humanities Award. He received a 1994 fellowship from the Louisiana Division of the Arts, the first filmmaker so honored in six years. In 1995, Mire was called a "Louisiana Success Story" at the Governor's Arts Awards. On May 17, 1997, the Acadiana Arts Council honored Mire with the "Distinguished Artist Award." Mire has consulted, served as advisor, researcher, location scout and production coordinator for several documentaries and feature films shot in Louisiana.